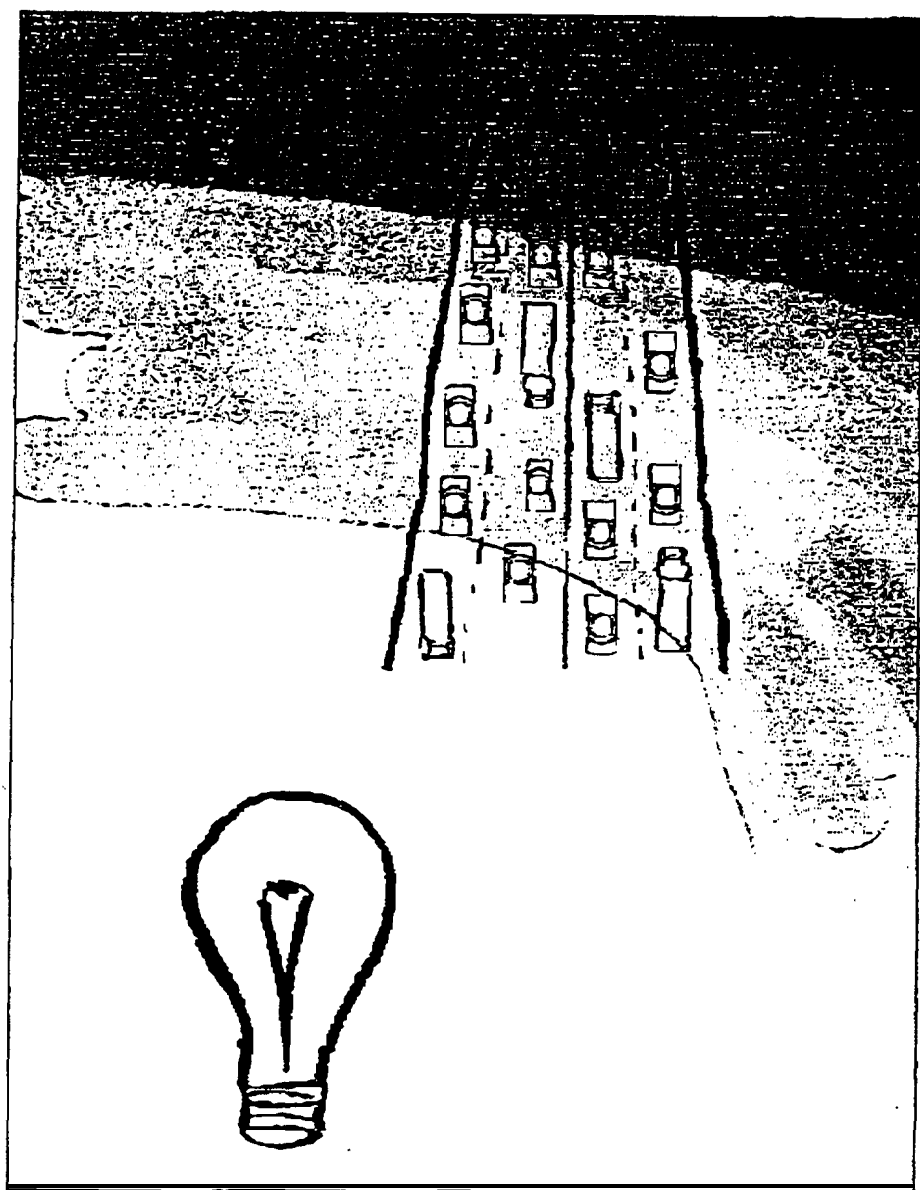


INTELLIGENT

Transportation Systems

ITS



The Future is Now:

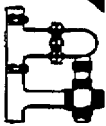
Intelligent Transportation Systems

Transportation in the United States faces immense challenges as we approach the 21st century. The emphasis is shifting from expanding transportation systems toward assessing and adapting our existing infrastructure to meet current and future demands, devising new ways to deal with growing demands on aging infrastructure, and addressing public concerns about the environment and accessibility for all Americans. At the John A. Volpe National Transportation Systems Center in Cambridge, Massachusetts, projects underway in the area of Intelligent Transportation Systems, support national efforts to accommodate all citizens with accessible, safe, and convenient transportation that is environmentally sound and enhances our nation's ability to compete in the global economy.



The Volpe Center is a national center of transportation and logistics expertise. By developing integrated systems approaches to critical transportation issues for all modes of transportation — air, rail, water, highway, pipeline, and public transit - the Volpe Center provides research, analysis, management, and engineering expertise to the Department of Transportation and other government agencies.

Intelligent Transportation Systems include advanced navigation, communication, surveillance, and control technologies associated with Intelligent Vehicle-Highway Systems (IVHS) and other modes of transportation. The Volpe Center has been working with such technologies since its inception over two decades ago. In addition to projects defining and testing the individual aspects of IVHS, the Center has become involved in strategic policy and planning issues of Intelligent Transportation Systems. A particular focus has been the potential impacts which Intelligent Transportation Systems will have on transportation safety, energy, the environment, and national competitiveness.



This brochure provides information about the Volpe Center's activities in Intelligent Transportation Systems. It outlines the Volpe Center's commitment to pursuing new transportation-related innovation at all levels and it provides information regarding opportunities for collaboration between the Volpe Center and other segments of the transportation community.

Please feel free to contact the Volpe Center staff identified in this brochure for further information about the Center or specific Intelligent Transportation Systems under development.

Dr. Richard R. John
Volpe Center Director

The Volpe Center provides, transportaton research, planning, analysis, and systems engineering services to the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), National Highway Traffic Safety Adminstration (NHTSA), Office of the Secretary of Transportation (OST), and Research and Special Programs Administration (RSPA) in the area of Intelligent Vehicle-Highway Systems. Volpe Center activities on behalf of these DOT and other governmental agencies are presented below.



Strategic Planning

Volpe Center Strategic Planning efforts strive to guide the development and implementation of Intelligent Transportation Systems in keeping with the goals of safety, enhanced mobility, and improved productivity for an inter-modal transportation system. This effort includes identifying appropriate roles for public, private, and academic participants and building cooperation among them.

Defense Conversion

In support of FHWA, the Volpe Center is organizing a series of meetings to explore possible defense conversion opportunities in transportation, particularly IVHS. This program focuses on considering ways in which the skills, resources and capabilities of the defense industry can work with DOT and others including national laboratories, state and local governments, and the academic community to enhance transportation research and development. This effort is consistent with recent administration initiatives, such as the Technology Reinvestment Program (TRP) and “Technology for America’s Economic Growth: A New Direction to Build Economic Strength,” issued in February.

The first of these meetings, entitled “Working Together: Transportation Opportunities for Technology Reinvestment,” was held at the Volpe Center in May, it brought together over 100 representatives of the defense, research, and industrial sectors to share ideas and information on this subject. Additional meetings will be held later in the year.

Contact: Bernard Blood, Chief, Volpe Center Transportation Strategic, Planning and Analysis Division

Federal Radionavigation Systems

The DOT’s Center for Navigation at the Volpe Center analyzes the feasibility of using existing and proposed radionavigation systems for transportation purposes. Recently, greater emphasis has been placed on surface transportation applications such as automatic vehicle location (AVL), automatic vehicle monitoring (AVM), response to Emergency and medical services request, provision of passenger and driver information, and collision avoidance relevant to railroad, public transit, and highway systems. In IVHS, land navigation requirements relative to Loran-C, Global Positioning Systems (GPS) and dead reckoning map matching are being evaluated as means to improve transportation safety and efficiency. Volpe Cenrer

work focuses on identifying ways to incorporate these technologies into an intelligent navigation system which meets civil and military requirements.

Volpe Center involvement in Global Positioning Systems encompasses both technological support and policy analysis to identify ways to accommodate civilian and military interests and support usability in civilian GPS applications, such as Intelligent Transportation Systems. Volpe Center personnel also support the DOT Navigation Council, which recently adopted interdepartmental DOT/DOD initiatives to examine future civil transportation applications of GPS. One such initiative supported by the Volpe Center is the Federal Radionavigation Plan, which sets requirements for Federal radionavigation services.

Contact: Maurice J. Moroney, Jr., Chief, DOT Center for Navigation, Volpe Center

Advanced Public Transportation Systems

The Advanced Public Transportation Systems (APTS) Program is a crucial element of the DOT initiative on Intelligent Vehicle Highway Systems. It was established by the Federal Transit Administration to assist in the development and evaluation of advanced technologies in public transportation.

Support to Advanced Public Transportation Systems Program

In support of the APTS Program, Volpe Center work includes multi-year programmed tasks as well as specific tasks defined in response to critical issues and needs that arise. Work areas include:

- Assessments of APTS Technologies
- Research of Technology Adaptations
- Field Test Evaluation
- Development of User Requirements and Equipment Standards
- Programmatic and Technical Support

The Volpe Center APTS project team also provides ongoing technical and other support to the IVHS America APTS Committee and its working groups:

- Bus Vehicle Area Network (VAN)
- Smart Cards/Smart Tags
- Spectrum
- Map and Spatial Databases
- Human Factors

Contact: Robert S. Ow, Volpe Center Office of Operations Engineering and Assessment

Benefits, Evaluation and Costs

The future impact of IVHS technologies and services will depend, in large part on the public's willingness to purchase and incorporate these services into daily transportation activities. The Volpe Center has projects underway in the area of Benefits, Evaluation and Costs to assess methodologies used in

independent benefits case studies and in developing new procedures to measure the impact of IVHS deployments.

Public Acceptance and Market for IVHS

Sponsored by FHWA, this project is designed to better understand public acceptance, willingness-to-pay, and behavioral response to Advanced Traveler Information Systems (ATIS). Research activities include examining the feasibility of utilizing laboratory-based driver behavior simulators; methods for assessing consumer response and the market evolution to new products, services, and technologies analogous to ATIS; review of data and research plans from operational tests and deployments addressing consumer response to ATIS products and services; and characterization of the products and services comprising the in-vehicle ATIS market.

This project will summarize what is presently known about driver response to ATIS from operational tests and computer-based driving simulators; increase agency understanding of different methods for measuring and predicting public response to new technologies; provide insight into potential market response to ATIS from the market experiences of analogous technologies; and review the current commercial world of ATIS products and services.

Contact: John O'Donnell, Chief, Volpe Center Economic Analysis Division

Impacts Assessment Framework

Work in this area will create a model-based framework to assess the impacts and benefits of IVHS services in terms of emissions, fuel consumption, congestion, and safety. This project will culminate in integrating transportation planning and traffic simulation models with energy and emissions models and using the resulting information to determine the impacts of various IVHS deployments. The initial emphasis is on modeling Advanced Traffic Management Systems (ATMS). Modeling of Advanced Traveler Information Systems (ATIS) is to follow. This project is sponsored by FHWA.

Contact: Walter Gazda, Volpe Center Economic Analysis Division

Machine Vision Technologies for Travel-Time Data Collection

Using IVHS-related video image processing technologies, the Volpe Center is directing an urban travel-time study for the FHWA. The Volpe Center, will coordinate with three metropolitan planning organizations to field test and evaluate several data collections later this year. Consistent methodologies will be developed for collecting urban travel-time data to augment the Highway Performance Monitoring System (HPMS) measurement of system performance. The methods may also have potential value to the Congestion Management Systems (CMS) called for by the Intermodal Surface Transportation Efficiency Act (ISTEA).

Contact: Michael Rossetti, Volpe Center for Transportation Information

Review of IVHS Benefits-Cost Studies

The primary purpose of this project is to review the approaches, methodologies and data utilized in selected IVHS benefits-cost studies. After initially reviewing over 40 IVHS benefits-cost studies, the project focused on eleven studies and undertook a rigorous examination of their methodologies and data sources. This project, sponsored by the Office of the Secretary of Transportation, will provide a

reference document on studies conducted to date and recommend improvements in analytical procedures for future benefits-cost studies.

Contact: Edward L. Ramsdell, Volpe Center Economic Analysis Division

Crash Avoidance

The Volpe Center provides support to the National Highway Traffic Safety Administration's (NHTSA) Office of Crash Avoidance Research in formulating strategic program directions and tactical research and development priorities; conducting crash problem studies; performing safety evaluations of IVHS operational tests; and assisting in the development of performance specifications.

Strategic and Tactical Planning

The Volpe Center provides support in the preparation of planning documents that refine and extend current program planning efforts and that integrate and unify various research and development activities within the context of overall NHTSA crash avoidance programmatic goals and objectives.

Crash Problem Studies

The research objective is to ascertain the extent to which IVHS crash avoidance technologies help reduce certain crashes. A project is underway to identify crash causal factors and applicable countermeasure concepts, model target crash scenarios, provide preliminary device effectiveness estimates, and identify countermeasure research data needs. The following are examples of crash types being addressed:

- Rear-End
- Lane Change/Merge
- Road Departure
- Reduced Visibility (night/fog)
- Backing
- Head-On
- Intersection

Safety Evaluations of IVHS Operational Tests

The Volpe Center develops and applies system evaluation protocols for technologies identified as having near-term potential as collision countermeasures. An example of such an operational test is the Travel Aid project in the state of Washington.

The Volpe Center also participates in safety evaluations of mobility-enhancing systems, especially those posing unusual forms of driver workload as a result of information systems within the vehicle. Safety evaluations currently focus on IVHS operational tests, including ADVANCE, FAST-TRAC, and DIRECT.

Support to Develop Performance Specifications

This project provides support to develop performance specifications applying to selected concepts for crash countermeasures. Work is being conducted in two areas:

- Technology Assessment: Identify, describe, and assess crash avoidance technology products and prototypes. Determine and characterize system parameters critical to benefits estimation in terms of crashes avoided.
- Systems Analyses: Devise crash countermeasure concepts, identify system characteristics and performance parameters, determine the feasibility of realiz-

ing such Concepts with current technologies, develop kinematic models of crash avoidance scenarios and compare different warning algorithms

Contact: Joseph Koziol, volpe Center office of Systems Engineering for all projects under Crash Avoidance.

Institutional Issues

Every sector of the community: private, public, universities, and law enforcement are affected by transportation issues. The underlying challenges associated with the development and deployment of integrated Intelligent Transportation System technologies within this diverse array of interests raises numerous institutional issues.

IVHS Institutional Issues: Case Studies of Operational Tests

The purpose of this project is to better understand and define the impact of non-technical, or institutional issues on multiple-sector, multiple-partner IVHS operational tests. It is expected that there will be commonalities observed across the nine selected operational tests which can be generalized to benefit future IVHS products and services deployments. This project is structured to include operational test program monitoring, case studies, and a lessons learned report.

Contact: Allan J. DeBlasio, Volpe Center Economic Analysis Division

Metropolitan Traffic Management

This project is designed to determine whether there are specific institutional factors or issues which impede coordination among regional or metropolitan traffic management operations. If these factors are deemed to exist, the project will attempt to determine how these impediments affect the deployment of IVHS traffic management technologies.

To identify problematic institutional factors, project team members collected data from six cities, interviewing municipal employees related to traffic systems in each city. They analyzed the issues related to coordination between multiple layers and sectors of government that had been problematic in the past for each city, and made recommendations based on the available alternatives.

Contact: Edward L. Ramsdell, Volpe Center Economic Analysis Division

System Development

The Volpe Center's Intelligent Transportation System development work reinforces multi-modal and multi-sectoral interface and cooperation. The Volpe Center has developed multi-modal Intelligent Transportation systems presently in use which encourage public/private partnership in support of Intelligent Transportation Systems research, development, and deployment.

International Transportation Information Tracking INTRANSIT

Using Global Positioning System (GPS) services to determine position, velocity, and other parameters, the INTRANSIT system records and tracks data on cargo items from moving vehicles, containers, or personnel located anywhere in the world. TO interconnect with the satellite systems used by INTRANSIT, a small computer is linked via modem to the Volpe Center satellite data fusion center,

which in turn links to the agencies Satellite Data Units (SDU), the system for information on any tracked item to logistics management systems. INTRANSIT supports many DOD global movements, UN activities, environmental clean up, rescue operations, and enforcement functions.

Contact: William O' Keefe, Volpe Center Advanced Concepts Development Division

Enhanced Traffic Management System

Via a network computer accessible to Federal Aviation Administration (FAA) air traffic controllers, the Volpe Center's Enhanced Traffic Management System (ETMS) compiles and displays real-time flight and weather data, predicts the flow of traffic up to eight hours in advance, and suggests possible solutions for resolving congestion problems and avoiding delays. The ETMS facilitates the movement of air traffic, and maximizes traffic flow through the system.

Contact: Richard Wright, Chief, Volpe Center Automation Applications Division

Automated Identification Technology

The Volpe Center is integrating multiple technologies in operational tests of automated identification and location tracking for international shipments by the U.S. Army. The multiple objectives of this project are to eliminate inefficiencies in paper-based supply and distribution systems; provide better and faster access to information about cargo and its movement; and permit operators on the ground to determine the contents of intermodal containers when normal systems fail. Radio frequency (RF) tag technologies are used to track and identify military vehicles and cargo within freight containers. Selected items in the distribution pipeline carry an RF tag with data about the cargo, which is reported over short distances to RF interrogation units positioned at critical points in the distribution pipeline, and relayed via satellite to the Volpe Center INTRANSIT System for dissemination.

Contact: Michael Wolfe, Chief, Volpe Center Intermodal and Logistics Systems Division

Automated Cargo Manifesting Assessment

The Volpe Center is assessing two concurrent demonstrations of automated cargo manifesting systems. The demonstrations are being conducted by the U.S. Army and the Defense Logistics Agency (DLA). The objective of both is to improve the quality, timeliness, and visibility of distribution processes from shipper to receiver. The systems automate domestic trailer manifesting and reconciliation, as well as bulk and line item receipt of truckload shipments. The first demonstration, DLA's Automated Manifesting System (AMS), uses laser optical cards to carry freight information. The second demonstration, the Supply Distribution Project (SDP), uses memory cards. Logistics data for depot shipments are electronically written to memory cards and laser cards, providing manifest detail for each item, multipack/pallet and complete truckload shipments.

Contact: Michael Wolfe, Chief, Volpe Center Intermodal and Logistics Systems Division

How We Work

The Volpe Center is in many ways a unique government agency. Unlike other Federal organizations, it is not funded directly in the Federal budget. Instead, the Volpe Center is market-driven by client agencies that fund the Volpe Center to address specific problems. Much like private business; the Volpe Center must deliver services and products to the satisfaction of its customers.

In order to best serve its clients, the Volpe Center often teams with leading transportation systems research and analysis organizations to fulfill project requirements. Drawing from nationally recognized companies and academic institutions with specialized expertise, the Volpe Center can quickly assemble exceptionally skilled and diverse project teams. Organizations that have contributed to Volpe Center work in Intelligent Transportation Systems include:

Arthur D. Little

Barrelle Memorial Institute

Booz Allen Hamilton

CALSPAN

Cambridge Systematics

Castle Rock Consultants

COMSIS

Coopers & Lybrand

Dowling Associates

EG&G Dynatrend

JHK & Associates

Massachusetts Institute of Technology

Parsons Transportation Associates

Pear Marwick and Mitchell

Sandia National Laboratories

Science Applications International Corporation (SAIC)

Sierra Research

SRI International

Unisys Corporation

University of California

University of Michigan

Urban Mobility Corporation

The Volpe Center is an element of the U.S. DOT Research and Special Programs Administration, and is located at 55 Broadway, Kendall Cambridge, MA 01242.

For program information, contact Gary Ritter, IVHS Program Coordinator, Volpe Center Plans Office, DTS-21, at (617) 494-2716. To inquire about career opportunities, contact Berry O' Leary, Volpe Center Human Resources Management, DTS-84.

The Volpe Center & Intelligent Transportation Systems

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Strategic
Planning

APTS

Benefits,
Evaluation and
Costs

Crash Avoidance

Institutional
Issues

System
Development
.....



Mission Statement

In support of Departmental policy objectives, the Center shall anticipate future national, state, local, and international transportation and logistics issues and requirements, and respond to current needs and priorities in accordance with its role as the national center of transportation and logistics expertise.



About the Volpe Center

The Volpe Center was established in 1970 to address the needs of the Department of Transportation (DOT) for systems research capabilities affecting critical intermodal transportation issues.

Since its inception, the Volpe Center's expertise has been made available to DOT and to other Federal agencies to meet their ongoing missions and to address urgent technical, economic, and institutional challenges. Now, more than two decades later, the Volpe Center has established a unique knowledge base combining research, analytical, and engineering capabilities.

The Volpe Center's program has always reflected national priorities. Initially, the Volpe Center contributed to DOT efforts to develop advanced concepts such as high-speed ground transportation and public transit systems. During the energy crisis of the late 1970s, the Volpe Center responded to the need for fuel conservation, assessments of alternative fuels, and the industrial implications of change. More recently, the Volpe Center has been heavily involved in the development of new air traffic control systems and concepts and, the investigation of critical safety issues such as vehicle crash-worthiness and aging aircraft. As a result of these and related activities, the Volpe Center has been designated a national center for transportation systems research and development, and supports an ever-expanding array of clients.

Looking to the future, the Volpe Center seeks to apply its special Intelligent Transportation System expertise to national and international transportation research, analysis, and system development priorities in continued cooperation with state and local governments, industry, academia, foreign countries, and multi-national organizations such as the World Bank and the United Nations.

